

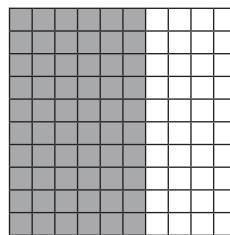
Decimal fractions – percentages

Percent comes from the Latin ‘per centum’ and means parts per hundred. It is expressed using the symbol %.

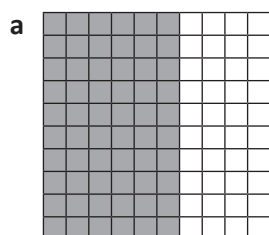
Here, 60% has been shaded. This is the same as 60 hundredths.

$$\frac{60}{100} = 0.60 = 60\%$$

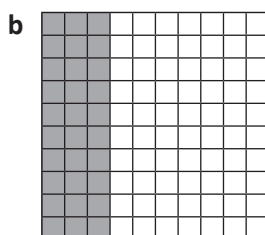
We commonly use percentages in sales – *25% off everything TODAY ONLY*;
on tests – *I got 85%*; and when we are gathering and reporting on data
– *78% of people surveyed love chocolate*.



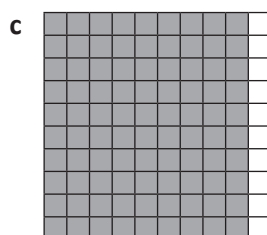
1 Fill in the missing values:



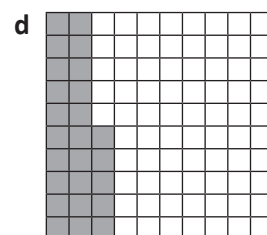
$\frac{60}{100}$	0.6	60%
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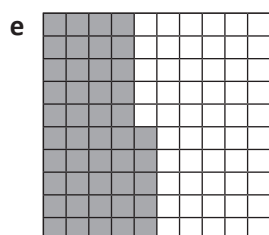
$\frac{30}{100}$	0.3	30%
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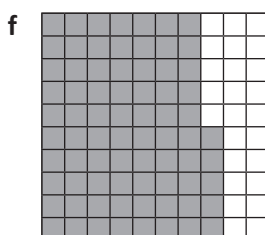
$\frac{90}{100}$	0.9	90%
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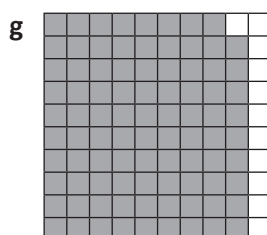
$\frac{25}{100}$	0.25	25%
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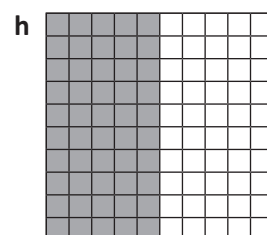
$\frac{45}{100}$	0.45	45%
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$\frac{75}{100}$	0.75	75%
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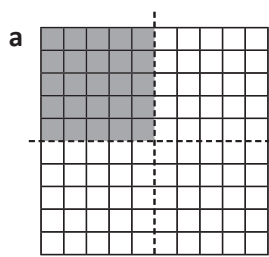
$\frac{89}{100}$	0.89	89%
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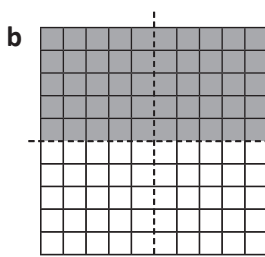
$\frac{50}{100}$	0.5	50%
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It is useful to know some common percentages such as 25%, 50%, 75% or 100%.

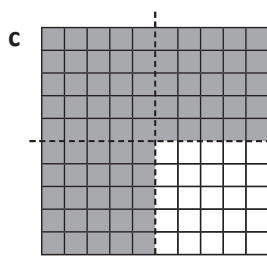
2 Shade the grids to show the following percentages:



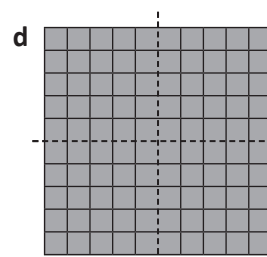
$\frac{1}{4}$	0.25	25%
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$\frac{1}{2}$	0.5	50%
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$\frac{3}{4}$	0.75	75%
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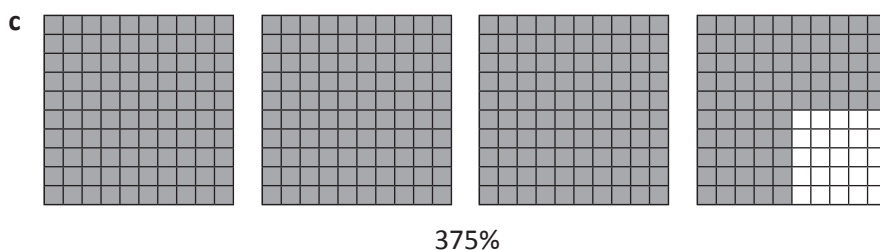
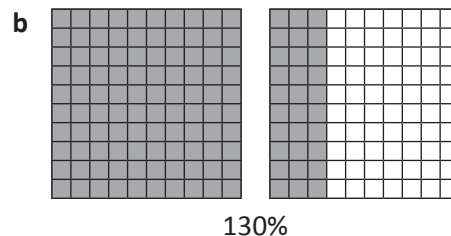
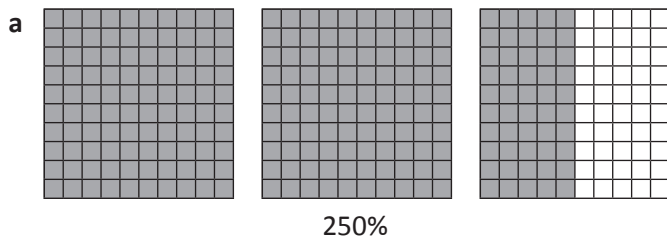


$\frac{4}{4}$	1.0	100%
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Decimal fractions – percentages

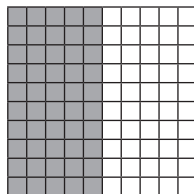
Not all percentage values are whole numbers between 1 and 100. We can have such things as 300% growth or percentages that contain decimals such as 3.5%.

3 Shade the grids to show the following percentages:

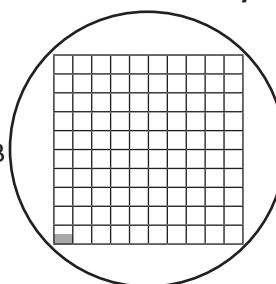


4 How would you show half a percent? Circle the option you think is correct. Discuss your choice with a partner. Do they agree?

Option A

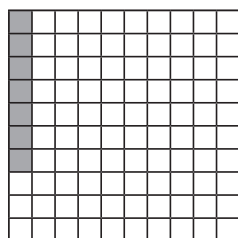


Option B

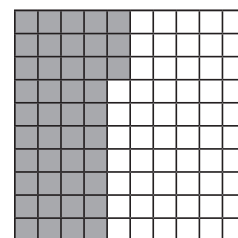


5 100 people were surveyed. They were asked to nominate their preferred way of eating vegetables. Shade the grids to show the survey results:

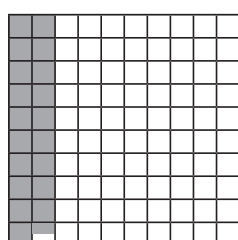
a 7% preferred their veggies boiled till they were all soggy and watery.



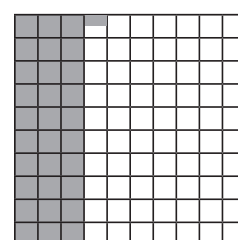
b 43% preferred their veggies stir fried.



c 19.5% preferred their veggies raw.



d 30.5% did not care how they were prepared because they weren't going to eat them anyway.





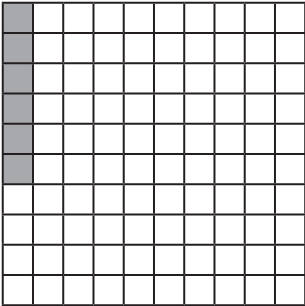
Getting ready

We have been using 100 grids to represent percentage, with each square representing 1%.



What to do

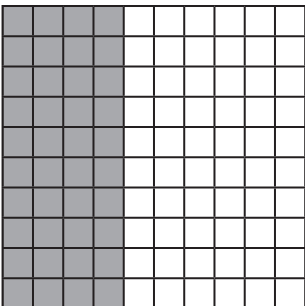
These grids are set up a little differently. Work with a partner to figure out what each square represents and then answer the questions.



Problem 1

These 6 squares have a value of 36.

- What is the value of 1 square? 6
- What is the value of the entire grid? 600
- If 50% of the grid is shaded, what value is shaded? 300

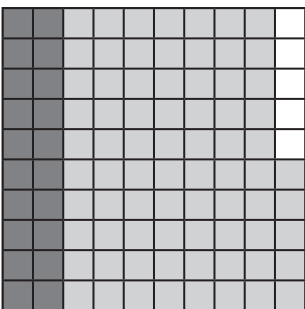


Problem 2



There are 140 convenience stores in Smallville.

- 40% of these stock your favourite Slurpee flavour. Use the grid to represent this information.
- How many stores sell your favourite flavour? 56

300 people



Problem 3

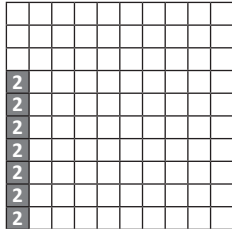
- If this grid represents 300 people, what does each square represent? 3 people
- How many people are represented by ten squares? 30
- 60 of the 300 people like watching sports. Represent this on the grid in red. 
- 225 people prefer playing sport to watching it. Represent this in green. 

Fractions of an amount – percentage

We often have to find percentages in real life such as ‘40% off – today only!’

40% of 100 is $\frac{40}{100}$ or 40. A \$100 item would be reduced by \$40.

That’s easy if everything costs \$100 but how do we find percentages of numbers other than 100? There are a number of ways to do this – here are some of them.



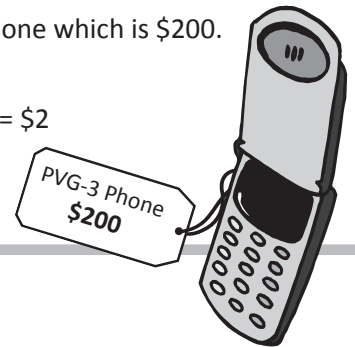
Look at this 100 grid. It represents the total cost of this phone which is \$200.

Each of the 100 squares represents 1% of this.

To find the value of a single square we divide: $\$200 \div 100 = \2

Each square or percent represents \$2.

How do we then find 7% of \$200? $7 \times \$2 = \14 .



1 Use the 100 grid to calculate:

a 5% of \$200 is \$10

b 20% of \$200 is \$40

c 10% of \$200 is \$20

d 22% of \$200 is \$44

e 15% of \$200 is \$30

f 50% of \$200 is \$100

g If the store advertises a sale of 15% off the cost of the phone, what is the saving in dollars? \$30

2 Use the 100 grid to calculate the following. 1 square represents 3 people:

300 people

a 8% of 300 people is 24

b 50% of 300 people is 150

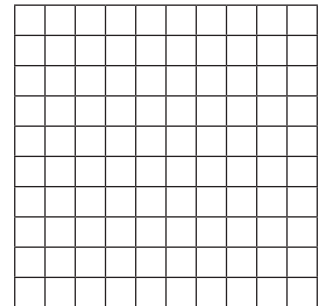
c 25% of 300 people is 75

d 40% of 300 people is 120

e 12% of 300 people is 36

f 80% of 300 people is 240

g If 65% of the 300 people surveyed liked chocolate, how many people liked chocolate? 195



3 Patterns can also help us understand percentages. Use patterns to calculate. The first row has been done for you.

10% of 40 is 4

5% of 40 is 2

20% of 40 is 8

10% of 50 is 5

5% of 50 is 2.5

20% of 50 is 10

10% of 60 is 6

5% of 60 is 3

20% of 60 is 12

10% of 100 is 10

5% of 100 is 5

20% of 100 is 20

10% of 500 is 50

5% of 500 is 25

20% of 500 is 100

10% of 1000 is 100

5% of 1000 is 50

20% of 1000 is 200

10% of 3000 is 300

5% of 3000 is 150

20% of 3000 is 600

Fractions of an amount – percentage

We can use fractions to help us calculate percentages.

How can we calculate 25% of 80?

We know that 25% is the same as $\frac{1}{4}$. To find $\frac{1}{4}$ of 80 we divide by 4.

$$80 \div 4 = 20$$

$$25\% \text{ of } 80 \text{ is } 20.$$

$$\frac{1}{2} = 50\%$$

$$\frac{1}{4} = 25\%$$

$$\frac{1}{3} = 33\frac{1}{3}\%$$

$$\frac{1}{5} = 20\%$$

$$\frac{1}{10} = 10\%$$

$$\frac{3}{4} = 75\%$$

4 Use your knowledge of fractions to calculate the percentages:

a 25% of 120 is 30

$$\frac{1}{4} \text{ of } 120 = \underline{30}$$

$$120 \div 4 = \underline{30}$$

b 50% of 250 is 125

$$\frac{1}{2} \text{ of } 250 = \underline{125}$$

$$250 \div 2 = \underline{125}$$

c 20% of 50 is 10

$$\frac{1}{5} \text{ of } 50 = \underline{10}$$

$$50 \div 5 = \underline{10}$$

d 25% of 16 is 4

e $33\frac{1}{3}\%$ of 66 is 22

f 75% of 80 is 60



REMEMBER

Calculators are also handy for working out percentages. This is how we calculate 40% of 50:

We enter 5 0 x 4 0 %

Our answer appears 2 0

5 Use a calculator to find these percentages:

a 20% of 300 mL = 60 mL

b 35% of 280 mL = 98 mL

c 15% of 800 kg = 120 kg

d 6% of 70 km = 4.2 km

e 25% of 150 mL = 37.5 mL

f 9% of \$700 = \$63

g 15% of 400 = 60

h 18% of 300 mL = 54 mL

i 90% of 1000 = 900

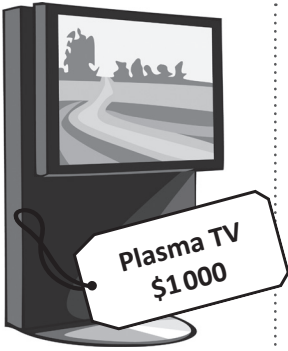



6 The answer is 75. Use a calculator to work out the percentages and tick all the squares that match the answer:

<input checked="" type="checkbox"/> What is 25% of 300?	<input checked="" type="checkbox"/> What is 75% of 100?	<input checked="" type="checkbox"/> What is 10% of 750?	<input type="checkbox"/> What is 15% of 55?
<input type="checkbox"/> What is 45% of 180?	<input type="checkbox"/> What is 35% of 300?	<input checked="" type="checkbox"/> What is 50% of 150?	<input checked="" type="checkbox"/> What is 20% of 375?



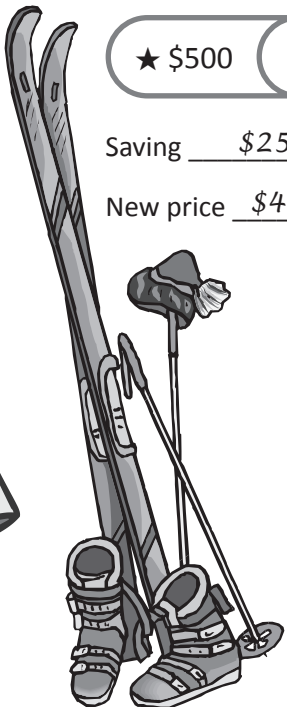


Fractions of an amount – finding discounts

We have to calculate discounts quite often in real life. Stores have many special offers and canny consumers can quickly calculate the savings to help them make decisions about their purchases.

1 How much would you save if the following discounts were offered? Choose a method to calculate:

			
Plasma TV \$1000	DVD \$12 each	Ticket \$50 each	Puppy \$250
10% off \$100	10% off \$1.20	10% off \$5	10% off \$25
25% off \$250	25% off \$3	25% off \$12.50	25% off \$62.50
50% off \$500	50% off \$6	50% off \$25	50% off \$125
60% off \$600	60% off \$7.20	60% off \$30	60% off \$150

2 You are helping your grandpa with his holiday shopping at Savers. Everything in the store marked ★ is 5% off, everything marked ★★ is 15% off and everything marked ★★★ is 20% off. Help your grandpa calculate both the savings and the new costs:

		
★★★ \$20	★ \$85	★ \$500
Saving \$3	Saving \$4.25	Saving \$25
New price \$17	New price \$80.75	New price \$475
		
★★★ \$15	★★ \$40	
Saving \$3	Saving \$6	
New price \$12	New price \$34	

**Getting ready**

Solve these shopping dilemmas. You can work with a partner or by yourself.
Show your mathematical reasoning for each problem.

**What to do**

DILEMMA 1 You have been eyeing off a new pair of jeans available at your local jeans shop and also online. They are \$100 at both suppliers.

In the sales, your jeans shop offers a discount of 20%, followed by a further reduction of 40% on the marked sale price. The online supplier offers a straight 60% discount.

Are these discounts the same? If not, which is the better deal?

No. Online store \$40 and Shop \$48

The online store is the better deal.



DILEMMA 2 Would you rather become 50% poorer and then 50% richer *or* become 50% richer and then 50% poorer?

They result in the same answer.

DILEMMA 3 The new game you want costs \$175 at one store and \$180 at another. The first store then offers a discount of 5% while the second offers a discount of 10%.

Which deal gives you the cheapest price?

Second store \$162